

Applicants respectfully submit again that catalytic activity depends on the amount of OH group bound to Ti of TiO_2 used as a raw material for preparing the catalyst. Therefore, the difference of the catalytic activity shows that the structures of the catalyst are different from each other.

In an article co-authored by one of the inventors of the '231 Patent (Gratzel), Mat. Sci. Soc. Symp. Proc., Vol. 139, pp. 373 (1989) which was submitted in the IDS filed April 5, 1999, data was reported concerning catalyst in which RuO_x is supported on TiO_2 . In connection with that article, particles of RuO_x were formed on TiO_2 of 100% rutile form or of a mixture of the rutile and anatase forms as shown in electronic microscope photographs. Applicants respectfully submit that, because the '231 is very unclear with respect to preparation of the catalyst, it is appropriate to refer to this article.

In contrast, as mentioned in Applicants' previous responses, it is clear that RuO_2 /rutile TiO_2 catalyst in accordance with the claimed invention, in which RuO_2 particles are not observed on a rutile TiO_2 carrier (as shown in a photograph in the Second Declaration filed August 13, 2000), can be obtained by supporting RuO_2 on rutile TiO_2 having high OH group content.

Therefore, with reference to the above-mentioned article, which Applicants believe is appropriate, it is clear that the catalyst of the claimed invention is different from the catalyst disclosed in Gratzel.

It should also be noted that in the abstract of this article it is indicated that the metal particles are selectively dispersed on the TiO_2 crystallites with the rutile structure. Thus, it is clear that the RuO_2 is dispersed on the rutile TiO_2 .

This means that the supported RuO₂ cannot be highly dispersed since the amount of OH groups on the TiO₂ is too small. This is demonstrated in Examples 8 and 17 in the specification of the present application. As a result, as shown in the article (page 329, Fig. 1b), the image of RuO₂ particles is observed in the electron microscope photograph.

Namely, this difference in the catalytic activities is caused by the difference of the amount of OH group bound to Ti of the TiO₂ used as a raw material for preparing the catalyst, even if the amount of OH group contained in the catalyst as a final product is the same as that contained in another catalyst prepared by using TiO₂ (rutile 100%) having a different amount of OH content in the TiO₂ used for preparing the catalyst. (It is actually impossible to measure the OH content in the catalyst as the final product.) The structures are different from each other because the catalytic activities are different from each other.

Further, Umemura discloses that a mixture of a vanadium compound powder and an anatase type TiO₂ powder was calcined at high temperature as 650 - 800°C to convert anatase crystalline form of TiO₂ to rutile form. Therefore, the rutile TiO₂ obtained has a low OH group content because OH group bound to Ti is dehydrated as H₂O at high temperature. In addition, the obtained product is a compound oxide catalyst as is described in column 2, line 6, and therefore, is not a supported catalyst.

Further, Bankmann also teaches that rutile TiO₂ is heated at a temperature of 700°C. However, the obtained rutile TiO₂ has low OH group content for the reason mentioned above.

TiO₂ having a high OH group content as specified in the present claimed invention can not be obtained. Moreover, Bankmann fails to teach use of a Ru compound.

In the ordinary method for preparing TiO_2 , the TiO_2 contains OH groups in a small amount because anatase TiO_2 is converted into rutile TiO_2 at a temperature higher than that at which OH groups are removed from TiO_2 . However, TiO_2 having a relatively high content of OH groups as in the present claimed invention is prepared by a method different from the ordinary method.

Applicants respectfully submit that the catalyst of the claimed invention is different from the catalyst disclosed in Gratzel and is not obvious from a combination of these cited references because unexpected results are obtained in the claimed invention, as evidenced by the two previously submitted Declarations.

Further, Buysch fails to teach that RuO_2 is supported on TiO_2 . Buysch also fails to suggest the dependency of catalytic activity on the amount of OH group bound to Ti.

In addition, rutile TiO_2 and Ru compounds are only disclosed in very many enumerated examples of Buysch. Therefore, Applicants respectfully submit that Buysch does not disclose the catalyst specified in the claimed invention and the result obtained in the claimed invention is not obvious to a person skilled in the art.

With respect to Bankmann and Umemura, Applicants respectfully submit that these references do not rectify the deficiencies noted above.

Lastly, the instant claims are product by process claims, and because the dependency of the catalytic activity on amount of OH group bonded to TiO_2 is clear, it can be said that the structure of the product claimed depends on the amount of OH group even if the amount of the OH group of the final product is unknown.

RESPONSE UNDER 37 C.F.R. § 1.116
U.S. Appln. No. 09/249,100


Therefore, the claimed invention is not obvious to a person skilled in the art because unexpected results are obtained as mentioned above and demonstrated in the previously submitted Declarations.

In conclusion, Applicants respectfully submit that the present claimed invention is not taught or suggested by the prior art of record. Accordingly, withdrawal of the rejections is requested.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

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Date: March 20, 2003